

# INVENTIONS & INNOVATION

## Success Story



## EVAPORATOR FAN CONTROLLER FOR MEDIUM-TEMPERATURE WALK-IN REFRIGERATORS

### New Fan Controller Reduces Energy Consumption up to 50%

#### Benefits

- ◆ Has saved over 6 billion Btu cumulatively through 2000
- ◆ Reduces evaporator and compressor energy consumption by 30% to 50%
- ◆ Provides even temperature distribution and lower air velocity which improves working conditions and results in workers keeping refrigerated spaces closed
- ◆ Has saved \$80,000 in energy purchases through 2000
- ◆ Reduces air movement, which maintains the natural moisture in open products, increasing freshness and shelf life without affecting overall relative humidity within the refrigerated chamber
- ◆ Increase equipment life and reduces maintenance and replacement costs
- ◆ Has avoided 425 tons of CO<sub>2</sub> emissions through 2000

#### Applications

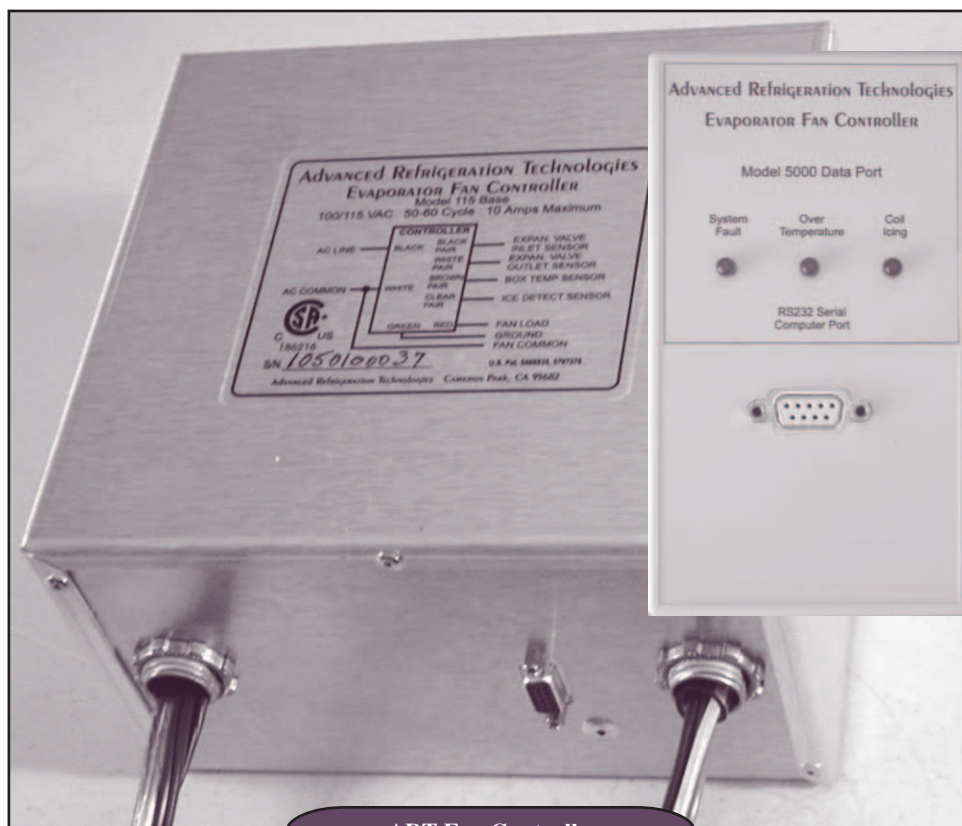
Low- and medium-temperature walk-in refrigeration and freezer systems like those used in restaurants, cafeterias, mess halls, correctional facilities, grocery and convenience stores, clubs, bars, taverns, hospitals, and other custom industrial applications.

#### Capabilities

- ◆ Reduces evaporator and compressor energy consumption and lengthens component life
- ◆ Can be retrofitted into existing refrigeration systems or incorporated into the design of new equipment

In many facilities, refrigeration energy use can account for up to 40% of the total energy consumption. Today, a new technology, the Advanced Refrigeration Technologies (ART) Fan Controller, can reduce the costs of using these refrigeration units up to 50%!

With assistance from the U.S. Department of Energy's Inventions and Innovation Program, ART commercialized an innovative control strategy for walk-in refrigeration systems. The ART Evaporator Fan Controller is inexpensive and easy to install. It regulates the speed of the evaporator fan motors to meet the need of each phase of the refrigeration cycle. Just as energy is saved by turning off the lights in an unoccupied room, this controller saves energy by running the fans only as fast as the refrigerator needs at the time.



ART Fan Controller



The concept and operation of the ART controller are technically simple. Refrigerant flow is sensed by temperature differential at the expansion valve within the evaporator. When refrigerant is not flowing through the evaporator, voltage is dropped to the evaporator fans, saving energy in two ways. First and foremost, the evaporator fans consume less energy. Second, heat introduced to the refrigerated chamber from the evaporator fan motors is decreased. This decrease in heat, coupled with a decrease in thermal inversion, results in a decreased overall box load, thereby reducing the compressor/condenser on-duty cycle. The slow fan speed maintains air circulation to avoid temperature stratification and also maintains natural product moisture, thereby increasing shelf life.

## Energy Savings and Pollution Prevention

The ART controllers save energy by reducing the overall power used by the refrigeration system. In most cases ART customers will realize a 1- to 2-year return on investment by installing the controllers. For large corporate customers with hundreds of facilities, this can equate to a very large savings over a short period of time. Cumulative energy savings through the year 2000 have surpassed 6 billion Btu. The associated reduction in CO<sub>2</sub> emissions is estimated to be 425 tons, and avoided energy purchases total \$80,000.

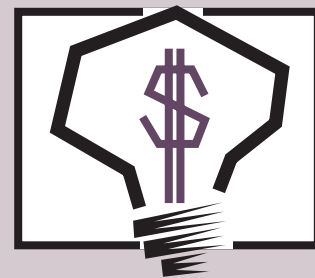
## System Economics and Market Potential

The two ART Evaporator Fan Controller models can be retrofitted into any suitable refrigerator. They offer a range of functionality, including simply reducing electricity consumption, tracking and storing energy consumption and savings data, and alarming the store when the refrigerator is not operating properly so that maintenance procedures can be implemented. Sales through 2000 have reached approximately 300 units, and by 2001 over 3000 units are estimated to be operating.

Many public and private utilities have offered ART customers significant rebates for installing the controllers, including Pacific Gas and Electric, San Diego Gas and Electric, and Southern California Edison. Several other utilities are evaluating the ART controllers for similar rebate and incentive programs. ART is also working with local, state, and federal governments for similar tax incentive programs.

### INVENTIONS AND INNOVATION PROGRAM

*The Inventions and Innovation Program provides financial assistance for establishing technical performance and conducting early development of innovative ideas and inventions. Ideas that have a significant energy-savings impact and future commercial market potential are chosen for financial support through a competitive solicitation process. Inventions funded by the program have saved enough energy to light 10 million homes per year. In addition, the program offers technical guidance and commercialization support to successful applicants. Ideas that benefit the Industries of the Future, designated by the Office of Industrial Technologies as the most energy-intensive industries in the United States, are especially encouraged.*



"The ERIP program was instrumental in the commercialization process of the Evaporator fan controller. Not only was the financial assistance invaluable the DOE guidance kept our product validation and testing viable, thorough and applicable to our potential future customers."

– Dave Kimber  
Vice President Marketing  
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